Quest reports on a drought prediction tool that makes use of indigenous knowledge

Deep in the rural areas of Africa, small-scale farmers generally don't have access to web-based forecasting systems. Although they may tune in to short-term weather reports on the radio, they're less likely to benefit from longer-term forecasts for the coming weeks, or seasonal climate forecasts that predict the likelihood of drought, particularly if those use technical jargon that the farmers don't understand. Besides, regional forecasts may not be very accurate at the local level, so farmers tend to rely on information that has been passed down from generation to generation – how the blooming of particular flowers, the behaviour of various animals, and changes in the numbers of certain insect species or migratory birds are indicators of approaching weather or seasonal transition.

Prof. Muthoni Masinde, who heads the Department of Information Technology at the Central University of Technology (CUT) in the Free State, grew up in an Mbeere community in eastern Kenya, where she learned some of this indigenous knowledge from her mother and other members of her village. After completing her undergraduate degree at the University of Nairobi, she moved to Brussels for her MSc, and then to Cape Town to do her PhD in UCT's Department of Computer Science. Her thesis, submitted in November 2012, was titled 'ITIKI: Bridge between African indigenous knowledge and modern science on drought prediction'.

ITIKI was the prototype of a drought early warning system for small-scale farmers that she developed for her doctoral research, and began testing in her home village. The name ITIKI refers not only to the acronym for 'Information Technology and Indigenous Knowledge with Intelligence', but also to the Mbeere word for a type of bridge made of sticks. Traditionally, these bridges would be built by members of the community who had acquired indigenous knowledge on their sturdy and safe construction. The ITIKI tool is likewise a bridge allowing two-way information exchange to integrate indigenous and scientific drought forecasting techniques.

Prof. Masinde continued working on the tool with the postgraduate students she supervised at CUT, where she founded the Unit for Research on Informatics for Drought in Africa (URIDA). In 2016 she was the first recipient of the Department of Science and Technology's Distinguished

Prof. Muthoni Masinde being filmed for a feature on CNN's Innovate Africa programme.

Young Woman Scientist: Research and Innovation Award, and she subsequently received a US$5 000 grant from USAID's Securing Water for Food programme, which allowed her to acquire the business skills needed to commercialise the prototype. In June 2019, ITIKI was officially launched in a ceremony at CUT, and it is now being implemented at sites in South Africa and Mozambique as well as Kenya.

Currently, the South African site – located in uMgungundlovu District Municipality in the Pietermaritzburg area of KwaZulu-Natal – is the smallest of the three, encompassing only 1 000 hectares, but some 1 000 tonnes of food is produced on that land, sustaining almost 2 000 people. In each country, workshops were held with community members, and liaison officers recruited, to gather indigenous knowledge from the local small-scale farmers. This was used to populate a database of possible weather-related indicators, specific to each region, which were then built into a mobile app. Smartphones with the app installed were issued to the liaison officers, allowing the community members' observations to be recorded on a day-to-day basis.

This information is supplemented with data from wireless sensor networks serving as automatic weather stations, recording temperature, humidity, atmospheric pressure, wind, soil moisture and rainfall. All of this information and data is fed into computer models that harness artificial intelligence, in the form of artificial neural networks and fuzzy logic, to downscale forecasts issued by the South African Weather Service (SAWS) to the local level. These forecasts are communicated to farmers via SMS, with the intention that they will provide a decision support system.

"If farmers can predict when and where rain will or will not fall in a specified region, they can plan accordingly with water conservation, planting and irrigation," Prof. Masinde explained. This would not only improve crop yields, but also ensure that scarce resources are used efficiently, increasing the farmers' resilience in times of drought.

- View Prof. Masinde's CNN feature at: https://edition.cnn.com/videos/business/2020/03/05/innovate-africa-drought-prediction.cnn

2020

Quest Volume 16 Number 2 2020

Academy of Science of South Africa (ASSAf)

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